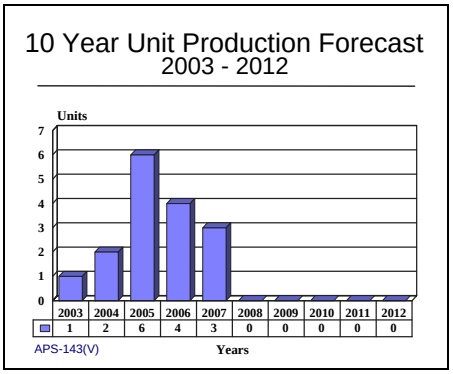
APS-143(V) - Archived 1/2004

Outlook

- APS-143(V) in service with ongoing logistics support
- Multimission operation popular with users
- Worldwide interest



Orientation

Description. Airborne lightweight, pulse-compression, multimission search and surveillance radar. It is known as OceanEye.

Sponsor

US Navy
Naval Air Systems Command
NAVAIR HQ
47123 Buse Road Unit IPT
Patuxent River, Maryland (MD) 20670-1547
USA
Tel: +1 301 342 3000
Web site: http://www.nawcad.navy.mil

Contractors

Telephonics Corp
Command Systems Division
815 Broad Hollow Road
Farmingdale, New York (NY) 11735
USA
Tel: +1 516 755 7000
Fax: +1 516 755 7046
Web site: http://www.telephonics.com

Status. In service, in production, ongoing logistics support.

Total Produced. Through 2002, an estimated 96 APS-143(V) systems had been produced.

Application. C-130, C-212, CL-604, Dauphin upgrade, EMB-111, E-9 (DHC-8), S-70(C), SC-7, SH-2G(A), NH-90, and Beech 200T aircraft, as well as USCG aerostats.

Price Range. Approximately US$650,000 to US$800,000 for the APS-143(V), depending on the version and other factors of the order.

Price is based on an analysis of contracting data and other available cost information, and a comparison with equivalent items. Individual acquisitions may vary, depending on program factors.

Technical Data

	Metric	US
Dimensions		

Weight		
APS-143(V)	80 kg	177 lb
Antenna size	107 cm x 28 cm	42 in x 11 in

Characteristics

APS-143(V)	
Frequency	9.25 to 9.70 GHz
Frequency agility	200 MHz
Peak power	8 kW min
Pulse width	10, 23.4, or 40 µsec
PRF	2,491, 1,513, 750 Hz (400 - 800 Hz in ISAR mode)
Detection	1 m² target beyond 20 nm in Sea State 3 from low altitude (typical)
Compressed pulse width	100 ns (weighted)
Compression ratio	1:1, 100:1, 400:1, 3,600:1
Maximum range	200 nm
Range resolution	0.025 nm (1 meter for ranging)
Azimuth accuracy	0.5° or better
Sector scan	60° to 300° or continuous 360° scan – operator selectable
Stabilization	+/- 30° pitch-and-roll
	Searchlight for ISAR/SAR and ESM antenna steering
	IFF dipoles available
Antenna bandwidth	500 MHz
MTBF	800 hr
Control configuration	1553B databus or standalone
Operating modes	Search
	Weather
	Return-to-ship
	ISAR
	Range profiling
	Range zoom
	Strip map SAR
	Spotlight SAR
	SAR/MTI
	Doppler beam sharpening
ECCM features	Sector blanking
	PRF Jitter
	Frequency agility (46 freq)
Display & Processing	
Radar monitor	875-line high-resolution TV display
	8" to 17" diagonal color (RS-170)
	Off-Center Zoom – up to 5 radii
	Ground Reference Stabilization over 5 radii of offset
Range scales	5, 10, 25, 50, 100, 200 nm
Memory	400 x 400 4-bit gray scale for video
	540 x 400 with overlay graphics
	1,024 x 800 and 8-bit color available
Display scales	2, 4, 8, 16, 32, 64, 128, and 256 nm

Design Features. This anti-submarine maritime patrol radar system includes a traveling wave tube (TWT) transmitter, a receiver, a radar control unit (search, beacon, weather modes), a rectangular flat-plate array antenna/pedestal, a digital scan converter, a bright display (8 to 17 inch diagonal, 875-line format with 2:1 interface), and a trackball or joystick cursor. Add-on cabin displays are available, as is a dual weather display.

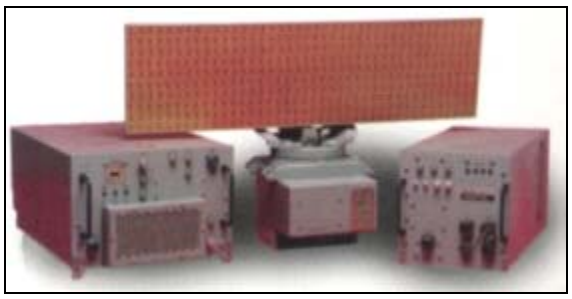
The original APS-128(V) radar was all-digital and used a scan converter to exhibit information in TV raster format. It featured target enhancement and clutter reduction along with frequency agility, sensitivity time control, Constant False Alarm Rate (CFAR), and scan-to-scan integration. It had a fully programmable microprocessor featuring alphanumeric and graphic options to satisfy different mission needs. The antenna system is pitch-and-roll compensated.

The APS-143(V) combined APS-128D digital radar characteristics with a pulse compression receiver similar to that used in the B-1B APQ-164(V) radar. It consisted of three units: the antenna, a receiver/transmitter, and a signal processor.

Operational Characteristics. System target detection parameters include a target 1 m^2 beyond 37 kilometers (20 nm) in Sea State 3 from low altitude (typical). Maximum range exceeds 200 nautical miles, and range resolution of 0.025 nautical miles and azimuth resolution of 0.5° are typical. Modes include track-while-scan of airborne or surface targets, DITACS (Digital Tactical System), inverse synthetic aperture radar (ISAR), air search modes with synthetic aperture radar, and MTI.

The system features a built-in Tactical Data Management System (TDMS). ESM, identification friend or foe (IFF), and weather options are available.

Users find the system valuable for aggressive surveillance operations that require early warning to protect against hostile intrusions from the sea. The system is useful for anti-surface and submarine operations (AsuW/ASW), littoral operations, Exclusive Economic Zone (EEZ) protection, and search and rescue operations.



APS-143(V)

Source: Telephonics Inc

Variants/Upgrades

APS-143(V). The APS-143(V) is an updated APS-128(V) modified with frequency agility and pulse compression for small-target detection. The system can be equipped with TWTs and Moving Target Indicator processing and can interface with missile guidance systems. The APS-143(V) can also interface with electronic support measures (ESM) and IFF systems. It can provide guidance for Penguin, Sea Skua, and other anti-surface missiles.

A pulse compression capability makes a smaller pulse width possible and gives higher resolution in high sea states. Pulse compression radars typically have a resolution several times better than standard pulse radars. Other advantages include sea clutter suppression, high average power with low peak power, and transmitter/receiver stability. Such radars can be equipped with the flat-plate or parabolic antenna.

The APS-143(V)1 stand-alone system was chosen to equip the USAF version of de Havilland Canada's DHC-8. It is a reliable radar with an air search mode and sophisticated display processing. It was developed to support range surveillance and safety operations, integrating via datalink with ground-based C^3I systems.

The APS-143(V)2 is used on selected shipborne aerostats for the detection and interdiction of drug-smuggling ships and aircraft. It is also used by the Air Force for range surveillance and safety. It combines onboard tactical navigation functions and communicates via datalink with a ground range command and control system.

The APS-143(V)3 has been selected for integration into the S-70C(M)1, Dauphin ASW, and NATO NH 90 helicopters. It has excellent small-target detection capability and is small in size. This variant features a track-while-scan function and a MIL-STD-1553B databus output to a central tactical navigation computer.

This is the most advanced version, with ISAR, Strip Map SAR, Spotlight SAR, oil slick detection, a 5-color weather mode, and 200-target tracking.

Program Review

Background. The original APS-128(V) family of airborne maritime radars grew out of research and development work carried out for the Canadian government. In the early 1970s, Litton Systems of Canada was contracted to provide updated radars for the Grumman S-2 Tracker and GAF Nomad. Litton was established in the defense electronics field but lacked experience in designing and producing maritime surveillance radars.

As a result, Eaton (which became Telephonics) was subcontracted to provide the updated technology, and Litton was responsible for the international marketing of the systems. The APS-503(V) and follow-on APS-504(V) radars were developed under Eaton licensing agreements. The licensing agreements were upheld for some four years, at which time Eaton began developing the APS-128(V).

In 1993, IBM Federal Systems (now Lockheed Martin) selected Telephonics to develop and supply an upgraded avionics suite for the US Navy Light Airborne Multi-Purpose System (LAMPS) Mk III Block II upgrade. The suite included intercommunications and radio management systems. Texas Instruments was competing with an ISAR variant of its APS-137(V) radar.

In 1994, the company delivered the first APS-143(V) to TACOM for installation in an aerostat, the Maritime Aerostat Tracking and Surveillance System (MATSS). The unit was used to demonstrate system capabilities to interested nations. Demonstrations were run from Elizabeth City, North Carolina. The radar was designed specifically for users with a surveillance requirement in congested coastal areas. The aerostat would operate at an altitude of 3,000 feet, producing a radar horizon of about 65 nautical miles (125 km). A variety of surface vessels were used to demonstrate the radar's capabilities.

In an October 1995 *Commerce Business Daily* notice, the Naval Air Systems Command announced that the Navy would issue an order agreement to Loral Federal Systems (now Lockheed Martin Corp) to conduct a preliminary assessment of the specifications required for full integration of the SH-60R with the Cooperative Engagement Capability system. The effort would include defining requirements for the system architecture and the Multi-Mode Radar Missile Detect Mode, and the requirements to be incorporated into the Ku-band datalink. The effort would also define requirements for interfacing the multimode radar (MMR) with the Integrated Mission Processor.

In FY97, the Navy conducted engineering development tests on the prototype multimode radar. The systems would be provided to the LAMPS upgrade system integrator and prime contractor.

In February 2000, Telephonics bought the RDR 1400 and RDR 1500 weather radars from AlliedSignal/ Bendix King. The radars are widely used throughout the world and will be integrated into the APS-143/147(V) multimode product lines.

In June 2000, Telephonics received a contract to provide China Tian Cheng Corporation, Beijing, with 30 RDR-1400C radars, with spare parts. Another contract was for an initial six APS-143(V)3 OceanEye Sea Surveillance and Imaging radars to support the Coast Guard's HU-25 Sensor Upgrade Program. The contract carried an option for up to 15 additional units, plus spare and logistical support for the radars.

In June 2001, Telephonics was contracted to provide up to 23 RDR-1700 radars for use on AgustaWestland naval helicopters and three APS-143(V)3 systems for use on an unnamed fixed-wing platform for airborne anti-drug surveillance activities.

In mid-2002, SAAB Aerospace awarded Telephonics a contract to provide the APS-143(V)3 for the NH 90 helicopters being procured as part of the Nordic Standard Helicopter Program (NSHP). The radar was intended primarily for the ASW versions of the NH 90, and would likely be carried by Norway's NSHP platforms as well.

Funding

US funding has been reported. Support funds will come from Operations & Maintenance accounts.

Recent Contracts

No recent contracts over US$5 million recorded.

Timetable

Month	Year	Major Development
	1972	Litton Systems Canada awarded S-2 update; Eaton licensed to develop the APS-503
	1975	APS-128(V) developed by Eaton Corp/AIL
	1976	Production started
	1982	DITACS introduced
	1987	APS-128(V) becomes the APS-143(V)
Sep	1993	Telephonics selected to develop radar (MMR) for the LAMPS III Block II upgrade
Mar	1994	APS-143(V) delivered for aerostat demonstrations
	2003	Last estimated deliveries from current contracts

Worldwide Distribution

APS-128(V) variants are operated by a number of nations in addition to the **US** (NASA). Identified users are as follows:

Argentina. The Argentinian Navy carries the APS- 128D radar on five C-212s.
Brazil. Installed the APS-128(V) on its 16 EMB-111 aircraft.
Chile. Carries the SAR-1 on nine EMB-111s.
China. Purchased six RDR-1400C radars, with spare parts.
Ecuador. Selected by Ecuador for two Catpass 250 Aero maritime patrol aircraft.
Gabon. Installed the SAR-1 on two EMB-111s.
Indonesia. Installed APS-128(V)B radars on its two C-130MPs.
Japan. Japan uses the APS-128(V)A/B system on 22 Beech 200Ts, and the APS-128D on two Falcon Jet F-900 aircraft.
Malaysia. Uses the APS-128(V)B on seven C-130MPs.
Puerto Rico. The Puerto Rican Police use one APS- 128 DITACS radar-equipped Beech 200T.
Singapore. Carries the APS-128D on five Shorts Skyvan aircraft.
Spain. Installed the APS-128D on one C-212 and seven C-130MPs.
Taiwan. Has 13 S-70Cs with APS-143(V)3 radars on board.
Uruguay. Uses the APS-128(V)C on one CASA C-212 and the APS-128(V)A on one Beech 200T.
Venezuela. The Venezuelan Navy uses the APS-128D on its four C-212s.
United States. The APS-143(V)1 is in use by the USAF on two de Havilland Dash-8 aircraft. The US Coast Guard has APS-143(V)2s installed on 10 GE Aerostats. The US Navy carries the APS-128(V) on its SH-60B ASW helicopters and will be installing the APS-147(V) MMR on its MH/SH-60R remanufactured platforms.

Forecast Rationale

Many nations are focusing their military capability on domestic and economic security issues and are using their aircraft and radars to protect fishing rights within their Exclusive Economic Zones (EEZ). Enforcing the 200-mile limits is an economic imperative for many users, while others have found the equipment effective for monitoring over-water test-range surveillance. The APS-128/143(V) family of radars has proven popular for maritime surveillance, and the radar is especially designed for small, easily maintained aircraft, suiting it to forces with limited resources.

Over the years the radars have been upgraded with such features as pulse compression and track-while-scan, increasing the DITACS version for those with a need to track small targets. Telephonics tries to maintain a

client base by making the radars available for sale and immediate delivery.

Most of the non-commercial and military-use orders have been filled, but the company had amassed an inventory of APS-128D and APS-143(V) units for off-the-shelf for customers. The delivery of the first APS-143(V) made it possible to evaluate its performance in the aerostat environment, and it was marketed in Southeast Asia to countries that have a surveillance need but cannot afford a fleet of aircraft.

Infrared and other electro-optical (IR/EO) sensors are being adapted to a variety of surveillance missions and can include new radars. The newer maritime surveillance customers are actively investigating these multi-sensor packages instead of just radar.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level			Speculative			
Designation	**Application**	**Thru 02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**Total 03-12**
APS-143(V)	NSHP (VARIOUS)	0	0	2	6	4	3	0	0	0	0	0	15
APS-143(V)	VARIOUS ACFT (VARIOUS)	57	1	0	0	0	0	0	0	0	0	0	1
APS-143(V)	Prior Prod'n:	39	0	0	0	0	0	0	0	0	0	0	0
Total Production		96	1	2	6	4	3	0	0	0	0	0	16